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10/697,821	10/29/2003	Robert Cochran	200311026-1	9535
22879	7590	07/14/2008	EXAMINER	
HEWLETT PACKARD COMPANY P O BOX 272400, 3404 E. HARMONY ROAD INTELLECTUAL PROPERTY ADMINISTRATION FORT COLLINS, CO 80527-2400				VY, HUNG T
ART UNIT		PAPER NUMBER		
2163				
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			07/14/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/697,821	COCHRAN ET AL.	
	Examiner	Art Unit	
	HUNG T. VY	2163	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 26 February 2008.
- 2a) This action is **FINAL**. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-25 is/are pending in the application.
 - 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-25 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____ .
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)	5) <input type="checkbox"/> Notice of Informal Patent Application
Paper No(s)/Mail Date _____ .	6) <input type="checkbox"/> Other: _____ .

DETAILED ACTION

1. As of entry of the amendment filed on 02/28/2008. Claims 1-25 are pending in this application. Upon reconsideration, Applicant's arguments with respect to claims 1-25 have been considered but are not persuasive (see response to Arguments below).

Summary of claims

2. Claims 1-25 are pending.

Claims 1-25 are rejected.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claim 22 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The claim 22 recites the "a cache mirror" which is not disclosed in the specification.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4 and 10-13, 18-21 and 24-25 are rejected under 35 U. S. C. § 102 (e) as being anticipated by Belsan et al. (U.S. patent No. 5,403,639).

Regarding claim 1, Belsan et al. discloses a storage system and a method of managing information storage in a storage system comprising:

a storage array a cabinet (*i.e.*, "a data storage media environment that can be heterogeneous. **Multiple types of media can be included within** or connected to file server system 1" (col. 4, line 60-62) and fig. 1), a plurality of storage devices contained within the cabinet of at least three different and distinct controller-to-storage device bus interface technology types (*i.e.*, "The data storage and management capability can include changing the format of the data stored to accommodate **various combinations of heterogeneous data processors**" (col. 2, line 18-22)) including volatile solid stage (*i.e.*, "cache memory 113" (col. 9, line 10), and "the disk drive array data storage sub-system 100" (col. 8, line 30-35) and "tape drive subsystem that can be an automated magnetic tape cartridge library system" (col. 8, line 15-18) and Examiner asserts that **three different** are "cache", "disk drive array" and "magnetic tape cartridge" (fig. 2)) and having a respective class hierarchy (*i.e.*, "The media used to store the data can be a disk array or any other media or combinations of media such as a disk array in combination with a backend automated magnetic tape cartridge library system, including a plurality of tape drives such that **the file serve system** comprises a **hierarchical data storage system** containing multiple types of media" (col. 3, line 30-35)); and

a controller contained within the cabinet (fig. 1) and coupled to the storage device plurality that executes hierarchical storage management and selectively controls (*i.e.*, "The media used to store the data can be a disk array or any other media or combinations of media such as a disk array in combination with a backend automated magnetic tape cartridge library system, including a plurality of tape drives such that **the file serve system** comprises a **hierarchical data**

storage system containing multiple types of media” (col. 3, line 30-35) usage of storage according to the different and distinct controller-to-storage device bus interface technology type (i.e., “*a third form of redundancy consists of **high usage** patterns*” (col. 12, line 1-20) and “*The disk drives 122-1 to 125-r are significantly **less expensive***” (col. 8, line 40-42) and “*Data that is stored in low access cylinders*” (col. 32, line 10-15)) whereby the controller allocates hierarchically inferior storage for temporary storage unexpected mission-critical storage (i.e., “*when data is **collected** and written to a cylinder separate from the normal destaging cylinder, that data is read-only or **low access** relative to the rest of the data in the logical cylinder...to the **hierarchical algorithm** since they differentiate data into **low access and regular access logical cylinders***” (col. 31, line 40-47) and Examiner asserts that “*data is collected*” is equivalent with “*temporary storage*” of claimed invention), and hierarchical storage management (HSM)-type low usage data storage (i.e., “**control unit** initiates the migration process at step 1501 and selects a logical cylinder at step 1502, **identified as a low access cylinder** by calculating the access rate from the last three fields in the Free space Directory Entry as illustrate in Fig. 14” (col. 32, line 25-30)).

With respect to claim 2, Belsan et al. discloses the storage array contains a hierarchy of storage devices connected by at least three different and distinct controller to-storage device bus interface technology types and having a respective performance hierarchy (i.e., “*The media used to store the data can be a disk array or any other media or combinations of media such as a disk array in combination with a backend automated magnetic tape cartridge library system, including a plurality of tape drives such that the file serve system comprises a **hierarchical data storage system** containing multiple types of media*” (col. 3, line 30-35) and “*cache memory 113*” (col. 9, line 10), and “*the disk drive array data storage sub-system 100*” (col. 8, line 30-35) and “*tape drive subsystem that can be an automated magnetic tape cartridge library system*” (col. 8, line

15-18) and Examiner asserts that **three different** are “cache”, “disk drive array” and “magnetic tape cartridge” (fig. 2))

With respect to claim 3, Belsan et al. discloses the storage array contains a hierarchy of storage devices connected by of at least three different and distinct controller-to-storage device bus interface technology types and having a respective economic or cost hierarchy (i.e., “cache memory 113” (col. 9, line 10), and “the disk drive array data storage sub-system 100” (col. 8, line 30-35) and “tape drive subsystem that can be an automated magnetic tape cartridge library system” (col. 8, line 15-18) and “The disk drives 122-1 to 125-r are significantly **less expensive**” (col.8, line 40-42) and Examiner asserts that **three different** are “cache”, “disk drive array” and “magnetic tape cartridge” (fig. 2)).

With respect to claim 4, Belsan et al. discloses a solid-state cache (i.e., “cache memory 113” (col. 9, line 10)) and shared memory (14) supplying storage as a distinct storage device type for a level of hierarchical storage for a level of hierarchical storage (figs. 1-2).

Regarding claim 10, Belsan et al. discloses the same limitation of claim 1 (see rejection of claim 1).

With respect to claim 11, Belsan et al. discloses the storage array contains a hierarchy of storage devices connected by at least three different and distinct controller to-storage device bus interface technology types and having a respective performance hierarchy (i.e., “The media used to store the data can be a disk array or any other media or combinations of media such as a disk array in combination with a backend automated magnetic tape cartridge library system, including a plurality of tape drives such that **the file serve system** comprises a **hierarchical data storage system** containing multiple types of media” (col. 3, line 30-35) and “cache memory 113” (col. 9, line 10), and “the disk drive array data storage sub-system 100” (col. 8, line 30-35)

*and “tape drive subsystem that can be an automated magnetic tape cartridge library system” (col. 8, line 15-18) and Examiner asserts that **three different** are “cache”, “disk drive array” and “magnetic tape cartridge” (fig. 2))*

With respect to claim 12, Belsan et al. discloses the storage array contains a hierarchy of storage devices connected by of at least three different and distinct controller-to-storage device bus interface technology types and having a respective economic or cost hierarchy (*i.e.*, “cache memory 113” (col. 9, line 10), and “the disk drive array data storage sub-system 100” (col. 8, line 30-35) and “tape drive subsystem that can be an automated magnetic tape cartridge library system” (col. 8, line 15-18) and “The disk drives 122-1 to 125-r are significantly **less expensive**” (col. 8, line 40-42) and Examiner asserts that **three different** are “cache”, “disk drive array” and “magnetic tape cartridge” (fig. 2)).

With respect to claim 13, Belsan et al. discloses at least a volatile-shared memory, a relatively higher performance non-volatile storage (*i.e.*, *a plurality of segments of volatile cache memory 113*” (col. 17, line 1-5)), and a relatively lower performance non-volatile storage (*i.e.*, “Changes to the virtual track directory are journaled to a non-volatile store” (col. 19, line 3-7)).

Regarding claim 18, Belsan et al. discloses the same limitation of claim 1 (see rejection of claim 1).

With respect to claim 19, Belsan et al. discloses a solid-state cache (*i.e.*, “cache memory 113” (col. 9, line 10)) and shared memory (14) supplying storage as a distinct storage device type for a level of hierarchical storage for a level of hierarchical storage (figs. 1-2)

With respect to claim 20, Belsan et al. discloses an hierarchy of storage devices having a respective performance hierarchy (i.e., “*The media used to store the data can be a disk array or any other media or combinations of media such as a disk array in combination with a backend automated magnetic tape cartridge library system, including a plurality of tape drives such that the file serve system comprises a hierarchical data storage system containing multiple types of media*” (col. 3, line 30-35) and “cache memory 113” (col. 9, line 10), and “*the disk drive array data storage sub-system 100*” (col. 8, line 30-35) and “*tape drive subsystem that can be an automated magnetic tape cartridge library system*” (col. 8, line 15-18) and Examiner asserts that **three different** are “cache”, “disk drive array” and “magnetic tape cartridge” (fig. 2))

With respect to claim 21, Belsan et al. discloses an hierarchy of storage devices having a respective economic or cost hierarchy (i.e., “cache memory 113” (col. 9, line 10), and “*the disk drive array data storage sub-system 100*” (col. 8, line 30-35) and “*tape drive subsystem that can be an automated magnetic tape cartridge library system*” (col. 8, line 15-18) and “*The disk drives 122-1 to 125-r are significantly less expensive*” (col. 8, line 40-42) and Examiner asserts that **three different** are “cache”, “disk drive array” and “magnetic tape cartridge” (fig. 2)).

Regarding claims 24-25, Belsan et al. discloses the same limitation of claim 1 (see rejection of claim 1).

Claim Rejections - 35 U.S.C. § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

a. Claim 5-9, 14-17 and 23 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Belsan et al. (U.S. patent No. 5,403,639) in view of Lee et al. (U.S. Pat. No. US007047358B2).

Regarding claims 5 and 14, Belsan et al. discloses all limitations of claimed invention recited in claims 1, 10 and 18 except for small computer Systems Interface (SCSI) and/or Fiber Channel (FC) storage device coupled to the controller by SCSI and/or FC Buses and supply storage as a distinct controller-to-storage device bus interface technology type for a level of hierarchical storage. However, Lee et al. discloses small computer Systems Interface (SCSI) and/or Fiber Channel (FC) storage device coupled to the controller by SCSI and/or FC Buses and supply storage as a distinct controller-to-storage device bus interface technology type for a level of hierarchical storage (*i.e., “NVRAM is often employed in higher-end **SCSI and Fibre Channel RAID controllers because it improves performance for many applications and confers reliability benefits in the face of power failure”** (col. 5, line 65-67 and col. 6, line 1-5)*). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify Belsan et al.’s system to use SCSI and/or FC in order to improves performance for many applications and confers reliability benefits in the face of power failure for the stated purpose has been well known in the art as evidenced by teaching Lee et al. (*col. 5, line 65-67 and col. 6, line 1-5*).

Regarding claim 6, Belsan et al. discloses all limitations of claimed invention recited in claim 1 except for serial AT-attached (SATA) storage devices coupled to the controller by a SATA bus. However, Lee et al. discloses serial AT-attached (SATA)

storage devices coupled to the controller by a SATA bus (*i.e., There is some expectation within the ATA community that the widespread adoption of serial ATA will result in an increase of drive counts within standard rackmount servers*" (col. 6, line 2-7)) and supplying storage as a distinct controller to-storage device bus interface technology type for a level of hierarchical storage (*Examiner asserts Lee et al. discloses "serial ATA will result in an increase of drive counts"* " (col. 6, line 2-7) so therefore, *SATA, SCSI and Fibre are supported by controller for level of hierarchical storage and further, with the same structure as SATA, SCSI and Fibre, those storage will supports the same as claimed invention*)). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify Belsan et al.'s system to use SATA in order to have opportunity involves its cost saving when storing the data that is less accessed for the stated purpose has been well known in the art as evidenced by teaching Lee et al (col. 6, line 4-7).

Regarding claims 7, 15, and 23, Belsan et al. and Lee et al. discloses all limitation of claim 7 that included the limitations of claims 4-6 (see rejection above) and with the same motivation as claims 5-6 above and Lee et al. discloses "ATA storage opportunity involves its cost saving over alternative drive" (col. 6. line 4-7).

Regarding claims 8 and 16, Belsan et al. discloses an hierarchical storage management controller for usage with a disk array (*i.e., "The media used to store the data can be a disk array or any other media or combinations of media such as a disk array in combination with a backend automated magnetic tape cartridge library system, including a plurality of tape drives such that the file serve system comprises a*

hierarchical data storage system containing multiple types of media" (col. 3, line 30-35)) and Lee et al. discloses FC and SATA disk drivers and that allocates SATA storage as uncommitted and unstructured storage (see *rejection 5-6 above* and Examiner asserts *that with the same structure and physical of SATA disk and FC, therefore, those storages interface will have the same function as allocating as uncommitted and unstructured storage*).

Regarding claims 9 and 17, Belsan et al. and Lee et al. discloses same limitation as recited in claim 5-6 (see *rejection above*) and further, Belsan et al. discloses data transfers including logical unit copies and snapshots (*i.e.*, "using the copy table implementation of the snapshot copy operation" (col. 21, line 5-10 and col. 20, line 30-40)).

b. Claim 22 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Belsan et al. (U.S. patent No. 5,403,639) in view of Hauck et al. (U.S. Pub. No. US2003/0158999 A1).

Regarding claim 22, Belsan et al. discloses the controller comprising at least two controller units (*Belsan discloses the multiple types of media can be included within in enclosure therefore, the system will have multiple types bus interface technology types in order to support for the multiple types of media (Fig. 1 and col. 4, line 60-62)* but Belsan does not discloses explicitly a cache mirror connection between the at least two controller units. However, Otterness et al. discloses a cache mirror connection between the at least two controller units (*i.e., "The controller system includes a disk array, a first controller, coupled to the disk array, for selecting a mirror cache line "n a second controller cache line to the second controller cache line" (0021)*). It would have been obvious at the time

the invention was made to a person having ordinary skill in the art to modify Belsan et al.'s system to use a cache mirror in order to improves performance access of disk system and minimize the performance degradation for the stated purpose has been well known in the art as evidenced by teaching Hauck et al. (0016).

Response to Arguments

7. Applicant's arguments filed on 02/26/2008 have been fully considered but they are not persuasive. Applicant made the following arguments:

- a. "Claims 1-4 and 10-13, 18-22 and 24-25 are rejected under 35...that shown in Belsan in which he different storage technologies are in separate arrays" pages 9-10.

Examiner's remarks:

Examiner does not agree with Applicant's argument since Belsan discloses "a data storage media environment that can be heterogeneous. Multiple types of media **can be included within** or connected to file server system 1" (col. 4, line 60-62) and clearly state "multiple types of media can be included within", therefore, all storage device can be stored within the enclosure or connecting to external. Belsan discloses all limitations recite on the claims. The Applicant argues about "a single, contained disk array that includes multiple bus interface technology types" but the claims do not support the Applicant's argument. The claims do not recite "a single, contained disk array". Further, Belsan discloses the multiple types of media can be included within in enclosure therefore, the system will have multiple types bus interface technology types in order to support for the multiple types of media (Fig. 1 and col. 4, line 60-62).

Applicant's argument about the rejection 103 but the amended claims which are not distinguish over Belsan. Therefore, the rejection is proper.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. When responding to the office action, Applicants are advised to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung Vy whose telephone number is (571) 272-1954. The examiner can normally be reached on Monday-Friday 8:30 am - 5:30pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Don Wong can be reached on (571) 272-1834. The fax numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications.

Information regarding the status of an application may be obtained from the patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either private Pair or Public Pair. Status information for unpublished applications is available through Private Pair only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have question on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Hung T Vy/
Primary Examiner, Art Unit 2163

July 4, 2008.